PV Inverter

SUNNY BOY 3300/3800

Installation Guide

SB33_38-IEN111851 | IME-SB3800 | Version 5.1

EN

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1 Notes on this Guide

1.1 Validity

This guide describes the assembly, installation, commissioning and maintenance of the following SMA inverters:

- Sunny Boy 3300 (SB 3300) from firmware version GRX33_3.02/3.02,
- Sunny Boy 3800 (SB 3800) from firmware version GRX38_3.05/3.05.

The firmware version will be indicated in the display once you have commissioned the inverter.

Keep this guide in a convenient place for future reference.

1.2 Target Group

This guide is for electrically qualified persons. The tasks described in this guide may be performed by electrically qualified persons only.

1.3 Additional Information

You will find further information on special topics such as designing a line circuit breaker or the description of the operating parameters in the download area at www.SMA.de/en.

Refer to the user manual provided for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

DANGER!

"DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

"WARNING" indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

"CAUTION" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury!

NOTICE!

"NOTICE" indicates a situation that can result in property damage, if not avoided.

Information

Information provides tips that are valuable for the optimal installation and operation of your product.

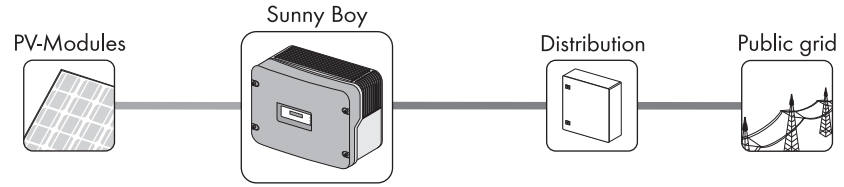
☑ This symbol indicates the result of an action.

2 Safety

2.1 Appropriate Usage

The Sunny Boy is a PV inverter, which converts the DC current of the PV generator to AC current and feeds it into the public grid.

Principle of a PV plant with this Sunny Boy



The Sunny Boy may only be operated with PV generators (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the Sunny Boy.

When designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The free design program "Sunny Design" (www.SMA.de/en/SunnyDesign) will assist you. The manufacturer of the PV modules must have approved the modules for use with this Sunny Boy device. You must also ensure that all measures recommended by the module manufacturer for long-term maintenance of the module properties are taken (see also Technical Information "Module Technology" in the download area of www.SMA.de/en).

Do not use the Sunny Boy for purposes other than those described here. Alternative uses, modifications to the Sunny Boy or the installation of components not expressly recommended or sold by SMA Solar Technology AG void the warranty claims and operation permission.

Certified Countries

Providing correct settings, Sunny Boy 3300/3800 complies with the following standards and guidelines (status: 11/2010):

- VDE 0126-1-1 (02.2006)
- RD 1663/2000 (2000)
- G83/1 (09.2003)
- CER/06/190 (10.2006)
- E 2750 (11.2004)
- PPC (2006/06)
- EN 50438 (12.2007)
- C10/C11 (08.2003)
- PPDS (2009)
- DK 5940 Ed.2.2 (02.2006) (valid for SB 3300-IT/3800-IT only)
- AS4777 (2005)
- IEC-utility Meeting 216
- UTE C15-712-1

SMA Solar Technology AG can preset special grid parameters for other countries/installation locations according to customer requests, after evaluation by SMA Solar Technology AG. You can later make modifications yourself by changing software parameters with respective communication products (e.g. Sunny Data Control or Sunny Explorer) (see section 5.7 "Setting the Grid and Country Parameters" (page 36)). To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at www.SMA.de/en, in the "Certificate" category for each inverter.

2.2 Safety Instructions

DANGER!

Danger to life due to high voltages in the inverter.

- All work on the inverter may only be carried out by an electrically qualified person.

CAUTION!

Danger of burn injuries due to hot enclosure parts!

- Do not touch the inverter's enclosure during operation.

NOTICE!

Dust and water in the inverter can damage the device.

Once the Electronic Solar Switch has been pulled out, the inverter only provides protection rating IP21. The inverter is then no longer protected against water and dust. In order to also maintain protection rating IP65 during temporary decommissioning, proceed as follows:

- Release and disconnect all DC connectors.
- Open all DC connectors and remove the cables.
- Close all DC inputs with the corresponding DC connectors and the supplied sealing plugs.
- Securely attach the Electronic Solar Switch again.

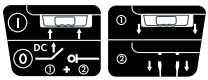
Grounding the PV generator

Comply with the local requirements for grounding the modules and the PV generator. SMA Solar Technology AG recommends connecting the generator frame and other electricity conducting surfaces in a manner which ensures continuous conductions, and grounding them in order to achieve maximum protection of the system and personnel.

2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type plate.

2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation Display. Indicates the operating state of the inverter.
	Ground fault or varistor defective. Read section 9.3 "Red LED is Glowing Continuously" (page 58).
	Error or disturbance. Read section 9 "Troubleshooting" (page 52).
	Tap to switch on the display light and switch to the next display message.
	Electronic Solar Switch (ESS) DC load disconnection unit • ❶ When the Electronic Solar Switch is plugged in, the DC circuit is closed. • ⓿ In order to interrupt the DC circuit and disconnect the inverter securely under load, first pull out the Electronic Solar Switch ❶ and then remove all DC plug connectors ❷, as described in section 7.2 "Opening the Inverter" (page 43).

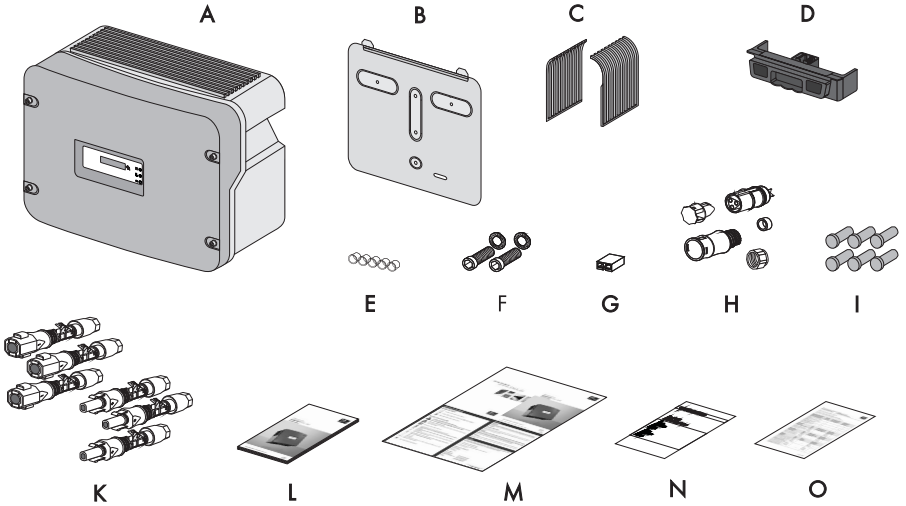
2.3.2 Symbols on the Type Plate

Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter may only be carried out by an electrically qualified person.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with household waste. For more information on disposal, see section 10.4 "Disposing of the Inverter" (page 65).
	CE mark. The inverter complies with the requirements of the applicable EC guidelines.
	The inverter has a transformer.
	Direct Current (DC)
	Alternating current (AC)
	Protection rating IP65. The inverter is protected against penetration by dust particles and water jets from any angle.
	RAL quality mark for solar products. The inverter complies with the requirements of the German Institute for Quality Assurance and Labeling.

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for visible external damage, such as cracks in the enclosure or in the display. Contact your dealer if anything is damaged or missing.



Object	Number	Description
A	1	Sunny Boy
B	1	Wall mounting bracket (back panel)
C	2	Ventilation grid (1 x right, 1 x left)
D	1	Electronic Solar Switch (ESS)
E	5	Filler-plug for wall mounting (sealing)
F	2	Cylinder bolts and M6 safety washers
G	1	Jumper for communication/fan test
H	1	AC coupling socket: socket unit, protective cap for socket unit, threaded sleeve, sealing ring, clamping nut.
I	6	Sealing plugs for DC plug connectors
K	6	DC plug connectors (3 x positive / 3 x negative)
L	1	Installation Guide
M	1	User Manual
N	1	Document set
O	1	Supplementary sheet with inverter factory settings

3.2 Identifying the Inverter

You can identify the inverter using the type plate. The type plate is on the right side of the enclosure.

The serial number (Serial No.) and the type (Type / Model) of the inverter, as well as device-specific characteristics, are specified on the type plate.

4 Assembly

4.1 Safety

DANGER!

Danger to life due to fire or explosion.

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in areas with a risk of explosion.

CAUTION!

Danger of burn injuries due to hot enclosure parts!

- Mount the inverter in such a way that it cannot be touched inadvertently during operation.

CAUTION!

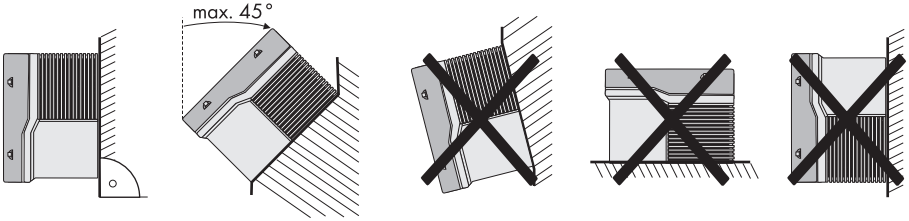
Risk of injury due to the heavy weight of the inverter!

- Take the inverter's weight of approx. 38 kg into account for mounting.

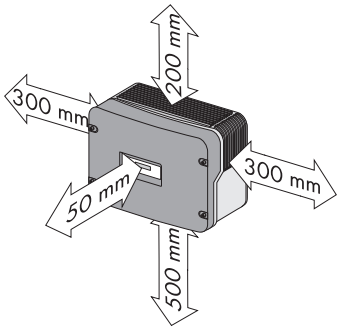
4.2 Selecting the Mounting Location

Consider the following requirements when selecting where to install:

- The mounting method and location must be suitable for the inverter's weight and dimensions (see section 11 "Technical data" (page 66)).
- Mount on a solid surface.
- The mounting location must at all times be clear and have safe access without the use of additional aids such as scaffolding or lifting platforms. Any possible service actions are otherwise limited.



- Install vertically or tilted backwards at a maximum angle of 45°.
- The connection area must point downwards.
- Never mount the device with a forward tilt.
- Never install the device with a sideways tilt.
- Do not mount horizontally.
- Install at eye level in order to allow operation conditions to be read at all times.
- The inverter must be easy to remove from the mounting location at any time.
- The ambient temperature should be below 40 °C to ensure optimal operation.
- Do not expose the inverter to direct sunlight to avoid power reduction due to excessive heating.
- In living areas, do not mount the unit on plasterboard walls or similar to avoid audible vibrations. The inverter can make noises when in use which may be perceived as a nuisance in a living area.
- Observe the minimum clearances to walls, other inverters or objects as shown in the diagram in order to ensure sufficient heat dissipation and sufficient space for removing the Electronic Solar Switch.



Multiple inverters installed in areas with high ambient temperatures

If necessary, increase the clearances between the individual inverters. In addition, make sure there is enough ventilation to ensure sufficient cooling of the inverters

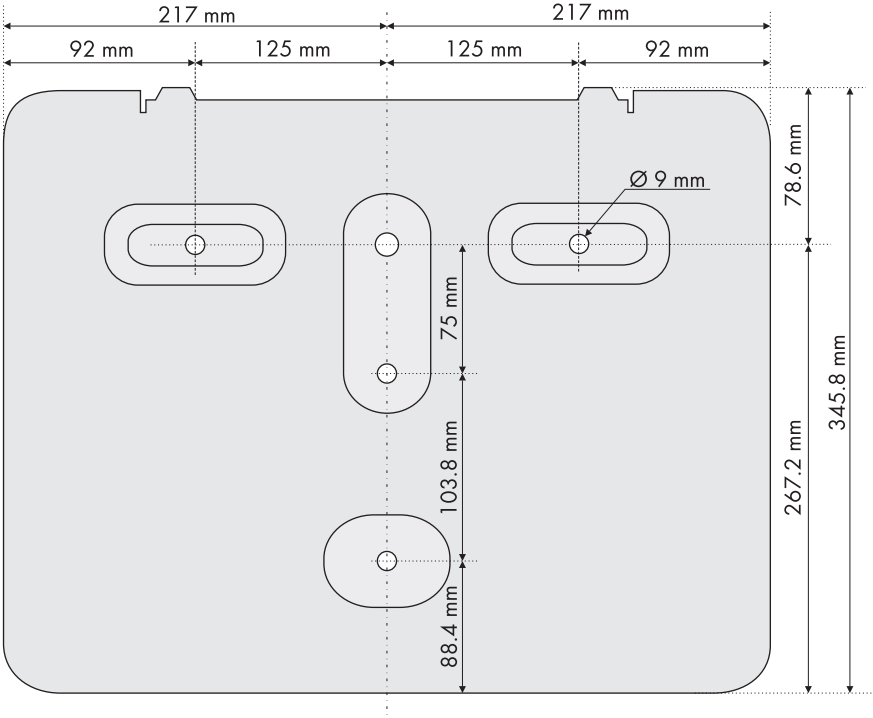
4.3 Mounting the Inverter with the Wall Mounting Bracket

CAUTION!

Risk of injury due to the heavy weight of the inverter.

- Note that the inverter weighs approx. 38 kg.

1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.

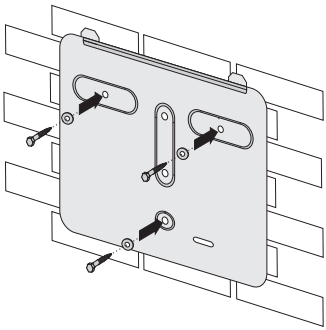


Mounting material

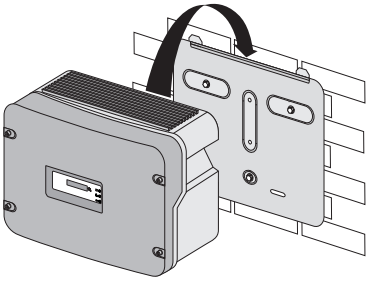
When mounting the bracket, use fastening material suitable for the mounting surface.

2. Fill in holes that are not required in the wall mounting bracket using the filler-plugs. Insert the filler-plugs into the wall mounting bracket from the outside (the side that will later be placed against the wall).

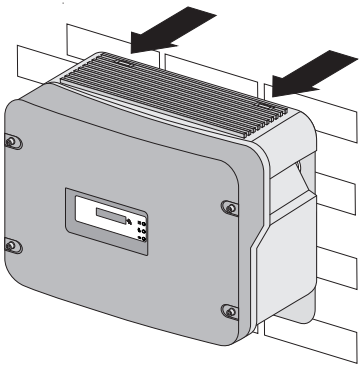
3. Attach the wall mounting bracket to the wall using appropriate screws and washers.



4. Mount the inverter with the upper fastening plates on the wall mounting bracket in such a way that both plates on the upper edge of the bracket pass through the cutouts on the inverter.

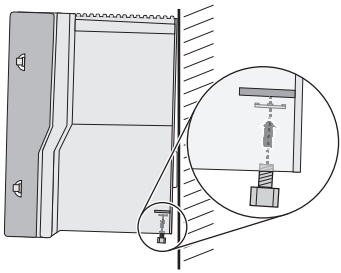


5. **Visual inspection**: The inverter is only correctly mounted when both rear panel mounting plates slightly protrude through the cutouts.

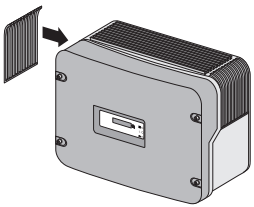


6. If a second protective conductor is required in the country of installation, ground the inverter and protect against excavation, as described in section 5.3.3 "Connecting Additional Grounding" (page 27).

7. If a second protective conductor is not required, secure the inverter against excavation:
   - Insert cylinder bolt with safety washer through the metal lashing eye on the bottom of the enclosure. The toothing of the safety washer must face toward the metal shackle.
   - Tighten cylinder bolt to a tightening torque of 6 Nm.



8. Check to ensure that the inverter is firmly fastened. The wall mounting bracket is designed so that the inverter tilts backward slightly on a perfectly vertical wall.
9. Attach the ventilation grids provided to the inverter. To help you identify the sides, "links/left" or "rechts/right" is printed on the inside of the ventilation grids.



☑ The inverter is now mounted.

5 Electrical Connection

5.1 Safety

NOTICE!

Damage to the inverter through electrostatic discharges.

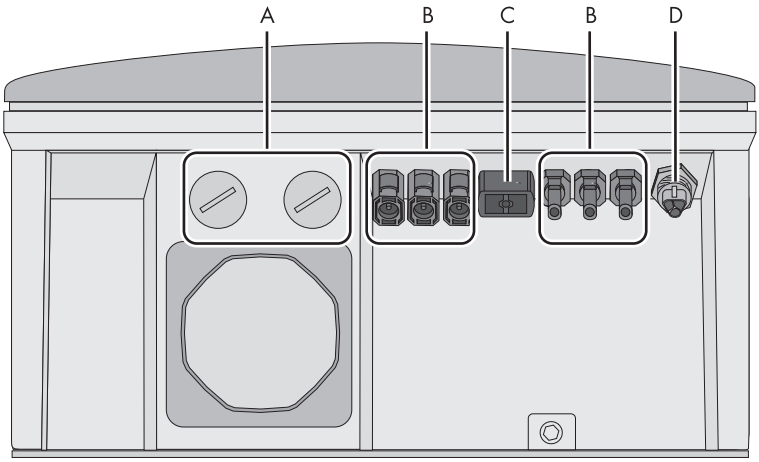
Internal components of the inverter can be irreparably damaged by static discharge.

- Before you touch a component inside the inverter, ground yourself by touching a grounded object.

5.2 Overview of the Connection Area

5.2.1 Exterior View

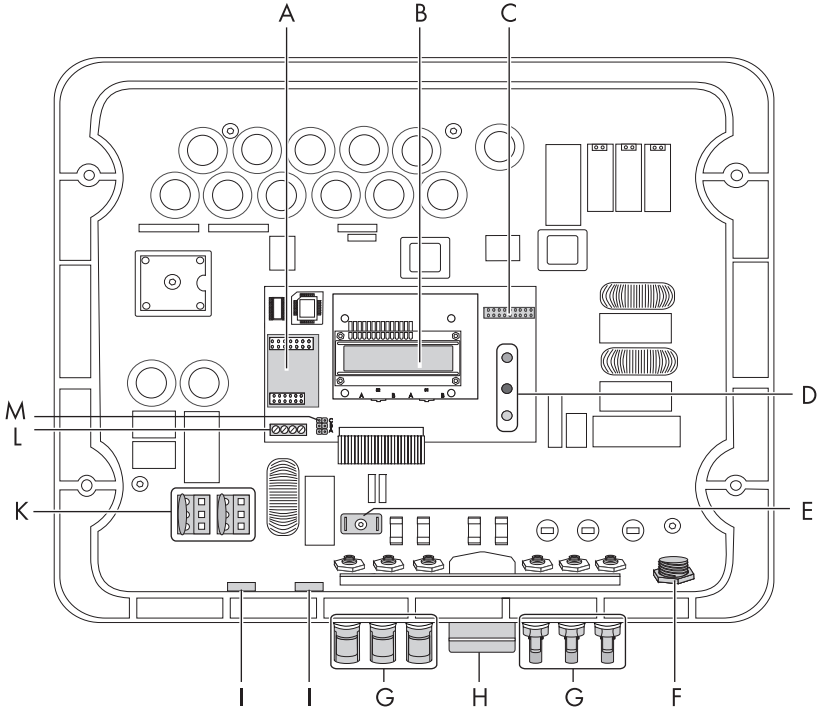
The following figure shows the assignment of the individual connection areas on the bottom of the inverter.



Object	Description
A	Enclosure openings for communication (with filler-plugs)
B	DC connectors for connecting the PV strings
C	Socket for connecting the Electronic Solar Switch (ESS) DC load disconnection unit
D	AC socket for grid connection

5.2.2 Interior View

The following figure shows the various components and connection areas of the open inverter.



Object	Description
A	Slot for communication
B	Display
C	Jumper slot for fan test
D	Operating status LEDs
E	Tab for grounding the cable shield with line-conducted communication
F	AC socket for grid connection
G	DC connectors for connecting the PV strings
H	Electronic Solar Switch (ESS) socket
I	Enclosure opening with filler-plugs for communication
K	Varistors
L	Communication Connection
M	Jumper slot for communication

5.3 Connection to the Power Distribution Grid (AC)

5.3.1 Conditions for the AC Connection

Connection requirements of the electric power company

Always observe the connection requirements of your electric power company.

Cable sizing

For optimum operation of the inverter, the grid impedance of the AC cable must not exceed 1 ohm. This is necessary, amongst other things, for the correct operation of the inverter.

The conductor cross-section should be dimensioned in a way that cable losses do not exceed 1 % at nominal power. Use "Sunny Design" (www.SMA.de/en/SunnyDesign) for this.

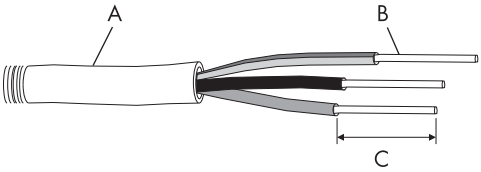
The maximum cable lengths are shown in the following table. Do not exceed the maximum cable length.

Conductor cross-section	Maximum cable length	
	SB 3300	SB 3800
4 mm²	18.5 m	16 m

The conductor cross-sectional area required in individual cases depends on the following factors:

- Ambient temperature,
- Routing method,
- Cable losses,
- valid installation guidelines of the respective country (of the installation location).

Cable Requirements



Position	Description	Value
A	External diameter	6 mm ... 14 mm
B	Conductor cross-section	4 mm²
C	Strip insulation	8 mm

Load disconnection unit

You must install a **separate** line circuit breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible rating can be found in section 11 "Technical data" (page 66).

Detailed information and examples for the rating of a line circuit breaker can be found in the Technical Information "Line Circuit Breaker" in the SMA Solar Technology AG download area at www.SMA.de/en.

DANGER!

Danger to life due to fire.

When more than one inverter is connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

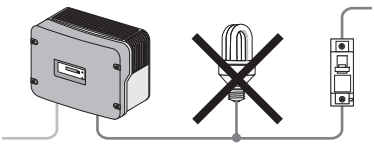
- Never connect several inverters to a single line circuit breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the line circuit breaker.

DANGER!

Danger to life due to fire.

When a generator (inverter) and a consumer are connected to the same line circuit breaker, the protective function of the line circuit breaker is no longer guaranteed. The current from the inverter and the grid can accumulate to overcurrent which is not detected by the line circuit breaker.

- Never connect consumers between the inverter and the line circuit breaker without protection.
- Always protect consumers separately.



NOTICE!

Damage to the inverter by using screw type fuse elements as a load disconnection unit.

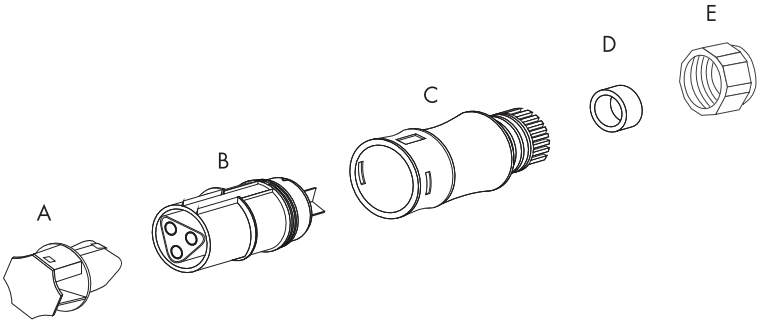
A screw type fuse element, e.g. D system (Diazed) or D0 system (Neozed) is not a load disconnection unit, and thus must **not** be used as a load disconnection unit. A bolt securing element serves as line fuse only.

When disconnecting under load using a screw type fuse element, the inverter can be damaged.

- Use only a load disconnection switch or a line circuit breaker as a load disconnection unit.

5.3.2 Connecting the Inverter to the Power Distribution Grid (AC)

Overview of the AC Connection Socket

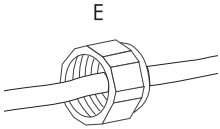


Object	Description
A	Protective cap for socket element
B	Socket element
C	Threaded sleeve with sealing ring for cable diameters of 10 mm ... 14 mm
D	Sealing ring for cable diameters of 6 mm ... 10 mm
E	Clamping nut

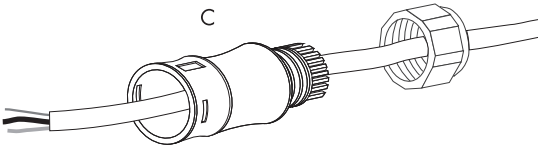
Procedure

1. Check the grid voltage and compare with "$V_{AC\ nom}$" on the type plate.

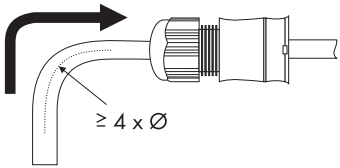
   The exact operating range of the inverter is specified in the operation parameters. The corresponding document is located in the download area at www.SMA.de/en, in the "Technical Description" category of the respective inverter.
2. Disconnect the line circuit breaker and prevent it from being reactivated.
3. If necessary, exchange the sealing ring of the threaded sleeve with the sealing ring provided.
   - Pull the sealing ring out of the threaded sleeve.
   - Insert the smaller sealing ring.
4. Pass the clamping nut (E) over the AC cable.



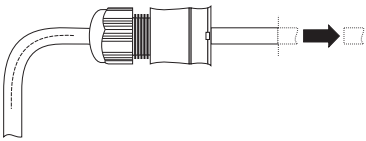
5. Pass the threaded sleeve (C) with the sealing ring over the AC cable.



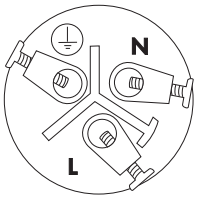
6. Bend the AC cable. The bend radius must be at least four times the cable diameter.



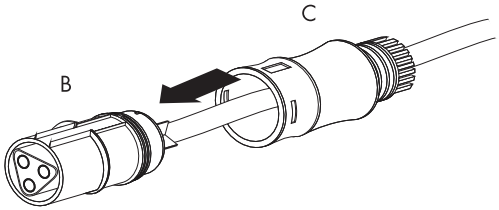
7. Shorten the cable.
8. Shorten phase L and neutral conductor N 4 to 5 mm.



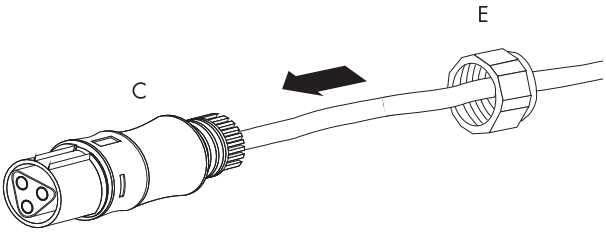
9. Insert the PE protective conductor (green-yellow) into the screw terminal with the earth sign on the socket element and tighten the screw. The PE protective conductor must be longer than the connection wires of N and L.
10. Insert the neutral conductor N (blue) in the screw terminal N on the socket element and tighten the screw.
11. Insert phase L (brown or black) into the screw terminal L on the socket element and tighten the screw.



12. Make sure the wires are securely connected.
13. Push the threaded sleeve (C) onto the socket element (B) until it audibly snaps into place.



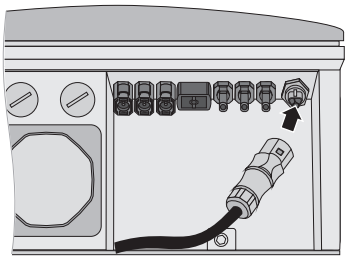
14. Screw the clamping nut (E) tightly onto the threaded sleeve (C). The clamping nut serves to seal and relieve strain.



☑ The AC connection socket has been screwed together.

15. Close the socket element with the protective cap provided, if the inverter has not yet been connected.

16. Insert the AC connection socket into the AC socket on the inverter. Remove the protective cap beforehand, if required.



☑ The AC cable is now connected to the inverter.

DANGER!

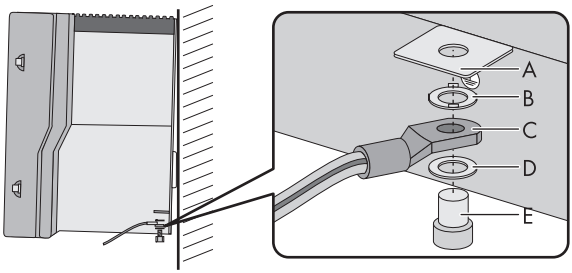
Danger to life due to high voltages in the inverter.

- Do not switch on the line circuit breaker until the inverter is securely closed and the PV generator has been connected.

5.3.3 Connecting Additional Grounding

If a second protective conductor, additional grounding or equipotential bonding is required, you can additionally ground the inverter on the enclosure.

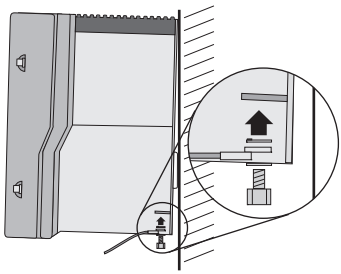
Additional Grounding Overview



Object	Description
A	Metal shackle on the underside of the inverter enclosure
B	Safety washer (within scope of delivery)
C	Terminal lug (M6) with grounding conductor
D	Washer
E	M6x12 cylinder bolt (within scope of delivery)

Procedure

1. Disconnect the inverter on the AC and DC sides as described in section 7.2 "Opening the Inverter" (page 43).
2. Align washer, terminal lug and safety washer on cylinder bolt. The toothing of the safety washer must face toward the metal shackle.
3. Insert the cylinder head screw into the metal shackle and tighten it using a torque of 6 Nm.



4. Check that the contact between the grounding conductor and the enclosure is in accordance with the regulations valid for the country of installation.

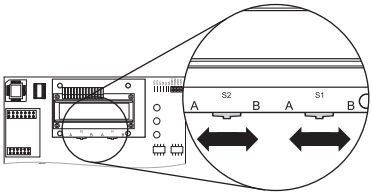
5.4 Setting the Display Language

You can set the language of the display using the switches underneath the display assembly inside the inverter.

Procedure

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 43).
2. Set the switches to the required language, as shown below.

Language	Switch S2	Switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A



For type SB 3300-IT/3800-IT inverters the following switch settings apply:

Language	Switch S2	Switch S1
Italian	B	A
English	A	A

3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).

☑ The display language is set.

5.5 Connection of the PV Generator (DC)

5.5.1 Conditions for the DC Connection

Use of Adaptors

Adaptors (branch connectors) must not be visible or freely accessible in the immediate surroundings of the inverter.

- The DC circuit may not be interrupted by adaptors.
- Observe the procedure for disconnecting the inverter as described in section 7.2 "Opening the Inverter" (page 43).

- Requirements for the PV modules of the connected strings:
  - Same type
  - Same number
  - Identical alignment
  - Identical tilt
- The connecting cables of the PV modules must be equipped with plug connectors. You will find the necessary DC plug connector for DC connection in the delivery.
- The following limit values at the DC input of the inverter must not be exceeded:

maximum input voltage	maximum input current
500 V (DC)	20 A (DC)

DANGER!

Risk of lethal electric shock or fire.

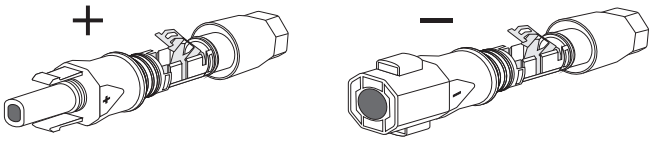
The maximum possible input current per string is limited by the plug connectors used. If the plug connector is overloaded, it can result in an electric arc and hence a risk of fire.

- Ensure that the input current for each string does not exceed the maximum flow current of the plug connectors used.

5.5.2 Assembling the DC Plug Connector

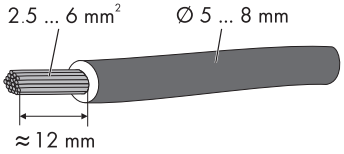
In order to connect to the inverter, all connection cables of the PV modules must be equipped with the DC plug connectors provided.

To assemble the DC plug connectors, proceed as follows: Ensure the plug connectors have the correct polarity. The DC plug connectors are identified with "+" and " – ".



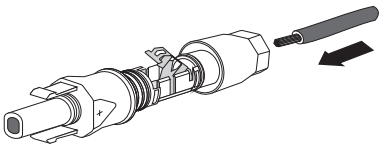
Cable Requirements

- Use a PV1-F cable.

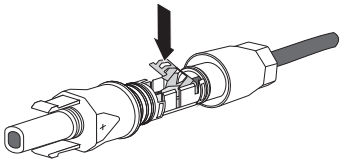


Procedure

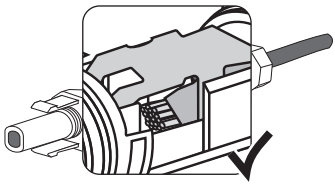
1. Insert stripped cable into the plug up to the limit.

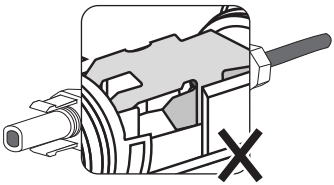
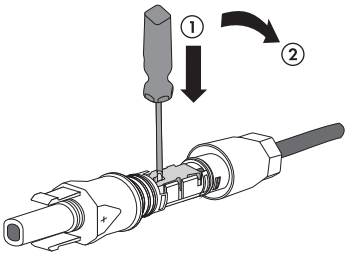


2. Press the clamping bracket down until it audibly snaps into place.

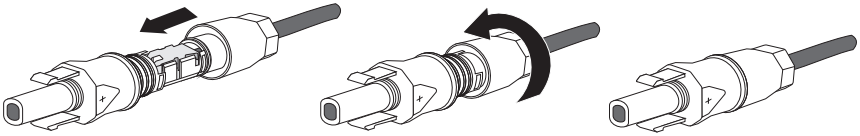


3. Ensure the cable is correctly in place.

Result	Measure
☑ If the conductors are visible in the hollow cavity of the clamping bracket, the cable is in the correct position. 	• Proceed to step 4.

Result	Measure
☑ If the conductors are **not** visible in the hollow cavity, the cable is not in the correct position. 	• Loosen the clamping bracket. For this purpose, use a screwdriver with a width of 3.5 mm.  • Remove cable and start again from step 1.

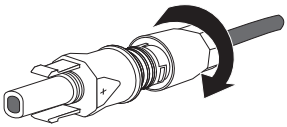
4. Push the bolted connection toward the thread and fasten to a tightening torque of 2 Nm.



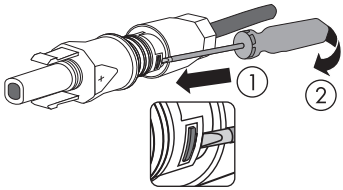
☑ The DC connectors are now assembled and can be connected to the inverters, as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 33).

5.5.3 Opening the DC Plug Connector

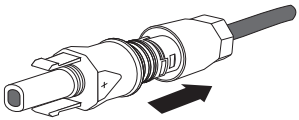
1. Screw the threaded joint off.



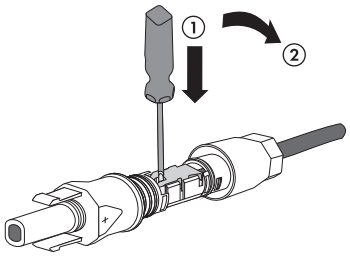
2. To release the plug connector, slot a screw driver into the side catch mechanism and lever out. For this purpose, use a screwdriver with a width of 3.5 mm.



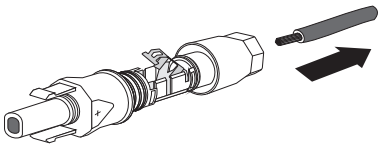
3. Carefully pull the DC connector apart.



4. Loosen the clamping bracket. For this purpose, use a screwdriver with a width of 3.5 mm.



5. Remove the cable.



☑ The cable is now removed from the DC plug connector.

5.5.4 Connecting the PV Generator (DC)

DANGER!

Danger to life due to high voltage at the inverter!

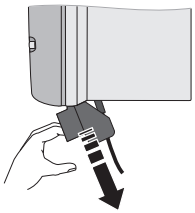
- Before connecting the PV generator, ensure that the line circuit breaker is switched off and that it cannot be reactivated.

NOTICE!

Excessive voltages can destroy the measuring device!

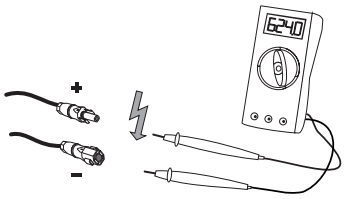
- Only use measuring devices with a DC input voltage range up to at least 1 000 V.

1. Disconnect the line circuit breaker and prevent it from being reactivated.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.



3. Check the connection cables of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

   With an ambient temperature over 10 °C, the open circuit voltage of the PV modules should not exceed 90 % of the maximum input voltage of the inverter. Otherwise, check the plant design and the PV module connection. If this is not done, the maximum inverter input voltage can be exceeded at low ambient temperatures.



NOTICE!

Exceeding the maximum input voltage can destroy the inverter!

If the voltage of the PV modules exceeds the maximum input voltage of the inverter, it can be destroyed by the overvoltage. All warranty claims become void.

- Do not connect strings with an open circuit voltage greater than the maximum input voltage of the inverter.
- Check the plant design.

4. Check the strings for ground faults, as described in section 9.3.1 "Checking the PV Generator for a Ground Fault" (page 58).

NOTICE!

Excessive currents can damage the inverter!

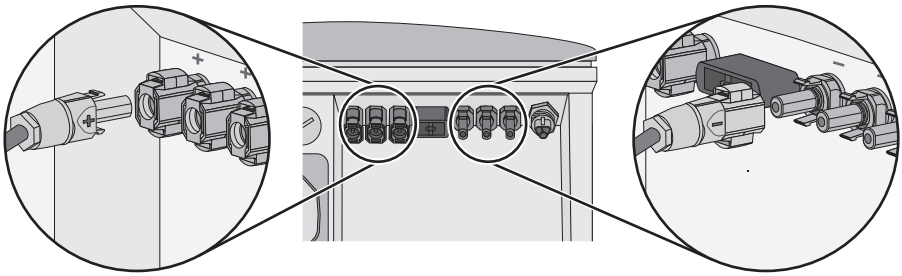
- The maximum current per DC connector plug may not exceed 16 A.

DANGER!

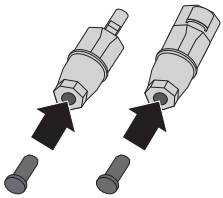
Risk of lethal electric shock.

- Do not connect strings with ground faults.
- First, rectify the ground fault in the respective string.

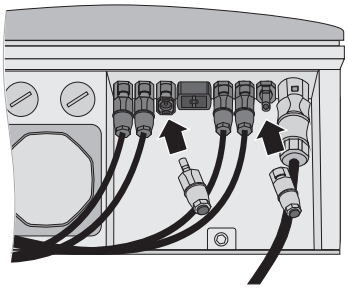
5. Check the DC connector for correct polarity and connect it.
   To release the DC plug connectors, see section 7.2 "Opening the Inverter" (page 43).



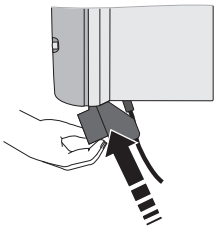
6. To create the sealing on the inverter, all the DC inputs have to be closed as follows:
   - Insert the provided sealing plugs into the unneeded DC plug connectors.
     Do **not** insert the sealing plugs into the DC inputs on the inverter.



   - Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.



7. Check the Electronic Solar Switch for wear, as described in section 8.2 "Checking the Electronic Solar Switch for Wear" (page 51) and attach it firmly.



NOTICE!

The Electronic Solar Switch can be damaged if it is plugged on incorrectly!

The Electronic Solar Switch can be damaged by high voltages if it has not been attached properly.

- Do not tighten the screw inside the handle.
- Insert the handle of the Electronic Solar Switch securely in the socket on the bottom of the enclosure until it audibly locks into place.
- Check whether the handle of the Electronic Solar Switch is securely connected.

☑ The PV generator is now connected.

5.6 Communication

The inverter is equipped with a socket for communication interfaces in order to communicate with special data acquisition devices (e.g., Sunny WebBox) or a PC with corresponding software (e.g. Sunny Data Control or Sunny Explorer).

Refer to the respective communication interface manual for a detailed wiring diagram and an installation description for the interface.

5.7 Setting the Grid and Country Parameters

Changing Grid-Relevant and Country Parameters

To change grid-relevant parameters, you need a personal access code - the so-called SMA Grid Guard Code. The application form for the personal access code is located in the download area at www.SMA.de/en, in the "Certificate" category for each inverter.

Ensure that you discuss the changes to these parameters with your electric power company.

A detailed description of the operating parameters for the inverter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

5.7.1 Setting the Installation Country

Using the "Default" parameter you can set the installation country and/or the grid connection standard valid for the country via a communication device (e.g. Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer). This, however, is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery from the type plate and the supplementary document provided with the factory settings.

5.7.2 Setting Off-Grid Operation

To operate the inverter in an off-grid system with Sunny Island, you must set the inverter via the "Default" parameter to off-grid ("OFF-Grid") operation.

You have several possibilities to set the inverter to off-grid operation:

- Setting via Sunny WebBox

  or

- Setting via Sunny Data Control or Sunny Explorer.

DANGER!

Danger to life due to high voltages in the event of outage of the power distribution grid.

If you set the inverter to off-grid operation, it does not fulfill any country-specific standards and regulations. Therefore, in the event of outage of the power distribution grid, there is a danger of back feed.

- **Never** operate the inverter directly on the power distribution grid when set to off-grid operation.

6 Commissioning

6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
   - The inverter is firmly fastened
   - Correct connection of the AC cable (grid)
   - Full connection of the DC cables (PV strings)
   - Unnecessary DC inputs are closed with the corresponding DC connectors and sealing plugs.
   - The enclosure lid is securely screwed in place
   - The Electronic Solar Switch (ESS) is securely plugged
   - The line circuit breaker is laid out correctly
2. Switch on the line circuit breaker.

   ☑ Green LED glows: commissioning has been successful.

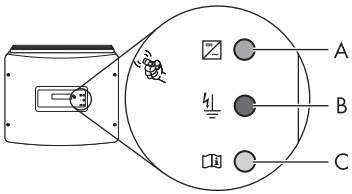
   or

   ☑ Green LED flashes in case of insufficient irradiation: grid connection conditions have not yet been reached. Wait for sufficient irradiation.

   or

   ☑ The red or yellow LED is glowing or blinking: an error has occurred. Proceed to step 3.

A	Green LED	Operation
B	Red LED	Ground fault or varistor defective
C	Yellow LED	Error



Self test in accordance with DK 5940, Ed. 2.2 for initial commissioning (applies to Italy only)

The Italian DK 5940 standard prescribes that an inverter can only operate on the power distribution grid after the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

Start the self-test as described in the section 6.2 "Self-Test in accordance with DK 5940, Ed. 2.2 (applies to Italy only)" (page 38). The test takes approx. 8 minutes.

3. Read section 9 "Troubleshooting" (page 52) and if necessary eliminate the error or disturbance.

6.2 Self-Test in accordance with DK 5940, Ed. 2.2 (applies to Italy only)

6.2.1 Starting the Self-Test by Tapping

You can start testing the disconnection times by tapping on the enclosure lid. A prerequisite here is that the country configuration of the inverter has been set to Italy (IT/DK5940) or "trimmed". Proceed as follows for checking the disconnection times:

1. Connect the PV generator with the inverter. The inverter can only initialize if the PV generator produces enough power. It is therefore not possible to test the disconnection times at night.
2. Connect the inverter on the AC side. For this, you have to create the AC connection (AC plug or direct connection) and/or switch on the line circuit breaker of the grid cable (fuse or automatic circuit breaker).
3. The inverter is now in the initialization phase, i.e. all 3 LEDs are glowing at the same time.

   Start the self-test **immediately** after all 3 LEDS have gone out by tapping on the display of the inverter.
4. The question of whether you would like to start the test sequence appears in the display. Tap on the display again within 30 seconds to confirm the question.

Once you have started the test sequence, the inverter checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency one after the other. During the tests, the inverter shows the values in the display which are described in section 6.2.2 "Completion of the Self-Test" (page 38).

6.2.2 Completion of the Self-Test

Note the values which are displayed during the self-test. These values must be entered into a test protocol. The test results of the individual tests are displayed 3 times, one after the other. The respective display message is displayed for 10 seconds.

The self-test changes the upper and lower disconnection thresholds for each protective function on a linear basis with a modification of 0.05 Hz/s and 0.05 Vn/s for the frequency and voltage monitoring. As soon as the actual measurement value is outside the permitted range (altered disconnection threshold), the inverter disconnects itself from the grid. In this way, the inverter determines the reaction time and checks itself.

Overvoltage Test

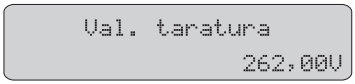
The inverter begins with the overvoltage test. During the test sequence, the voltage limit applied is shown in the display of the inverter.

The voltage limit is reduced successively until the shut-down threshold is achieved and the inverter disconnects from the grid.

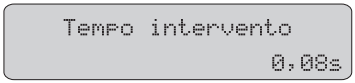
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value,

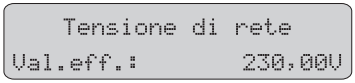
- Calibration value,



- Reaction time,



- Current grid voltage.



Undervoltage Test

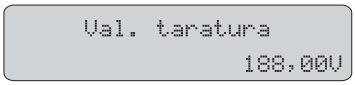
After the overvoltage test, the inverter performs the undervoltage test. During the test sequence, the current calibration value of the voltage limit applied is shown in the display of the inverter.

The voltage limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

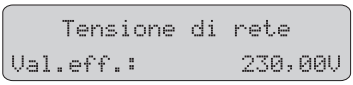
- Disconnection value,

- Calibration value,



- Reaction time,

- Present grid voltage.



Maximum Frequency

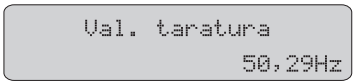
In a third step, the inverter tests the maximum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is reduced successively until the shutdown threshold is reached and the inverter disconnects from the grid.

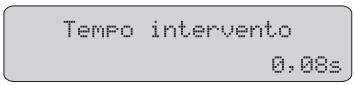
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value,

- Calibration value,



- Reaction time,



- Present grid frequency.

Minimum Frequency

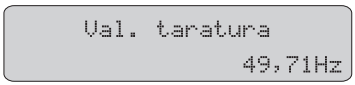
In the last step, the inverter tests the minimum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency limit is increased successively until the shutdown threshold is reached and the inverter disconnects from the grid.

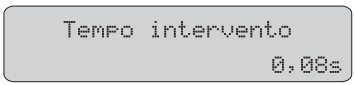
Once the inverter has disconnected from the grid, the display successively shows the following values one after the other:

- Disconnection value,

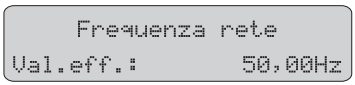
- Calibration value,



- Reaction time,



- Present grid frequency.



After the inverter has carried out the 4 tests, it switches to "MPP operation" mode. The original calibration values are then re-set and the inverter automatically connects to the grid. If you would like to carry out the test again, you must disconnect the inverter, i.e. disconnect it on the AC and DC sides and then later re-activate it. You can then restart the self-test as described in section 6.2.1 "Starting the Self-Test by Tapping" (page 38). The inverter starts again the test sequence, as described in section 6.2.2 "Completion of the Self-Test" (page 38).

7 Opening and Closing

7.1 Safety

DANGER!
Risk of lethal electric shock!

Before opening the inverter observe the following:

- Ensure that no voltage is present on the AC side.
- Ensure that no voltage is present on the DC side.

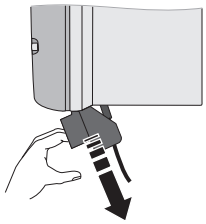
NOTICE!
Static discharges can damage the inverter!

Internal components of the inverter can be irreparably damaged by electrostatic discharge.

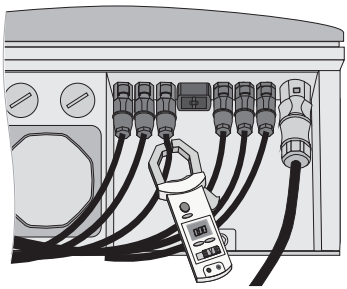
- Ground yourself before you touch a component.

7.2 Opening the Inverter

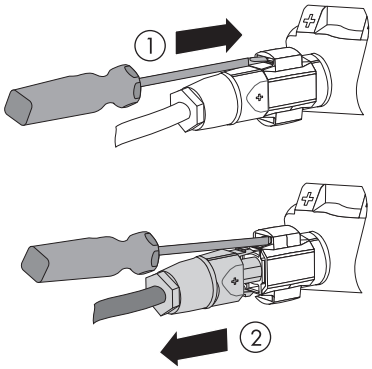
1. Disconnect the line circuit breaker and prevent it from being reactivated.
2. Pull the Electronic Solar Switch downward, slightly towards the wall.



3. Using a current probe, ensure that no current is present at all DC cables.
   ☑ If current present, check the installation.



4. Unlock all DC connectors. For this purpose, use a screwdriver with a width of 3.5 mm.
   - Insert a screwdriver into one of the side slits (1).
   - Disconnect DC connectors (2).

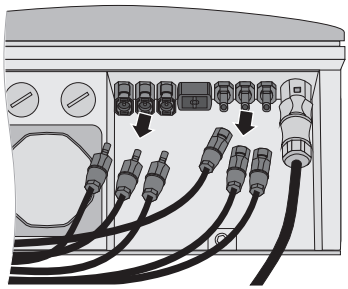


DANGER!

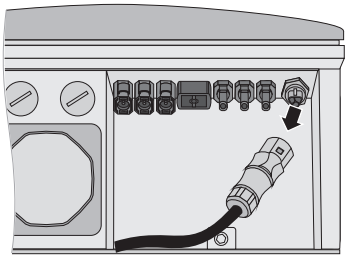
Danger to life due to unsafe disconnection from the PV generator!

A secure separation from the PV generator is only guaranteed after pulling off the Electronic Solar Switch **and** all DC connectors.

- Remove all DC connectors to completely disconnect the PV generator from the inverter.



5. Ensure that no voltage is present at the DC plugs on the inverter.
   ☑ If voltage is present, check the installation!
6. Pull out the AC plug.



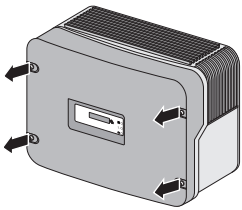
7. Check whether all LEDs and the display have gone out.

DANGER!
Danger to life due to high voltages in the inverter!

The capacitors in the inverter require 15 minutes to discharge.

- Wait 15 minutes before opening the inverter.

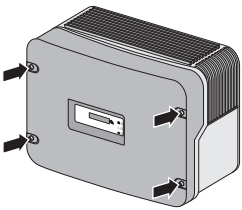
8. Loosen the screws of the enclosure lid.
9. Pull the lid forward smoothly.



☑ The inverter is now open and free of voltage.

7.3 Closing the Inverter

1. Secure the lid with the 4 screws and the safety washers with the toothing facing toward the lid. The screws must be tightened with approximately 6 Nm torque to ensure the sealing of the enclosure and the grounding of the lid.

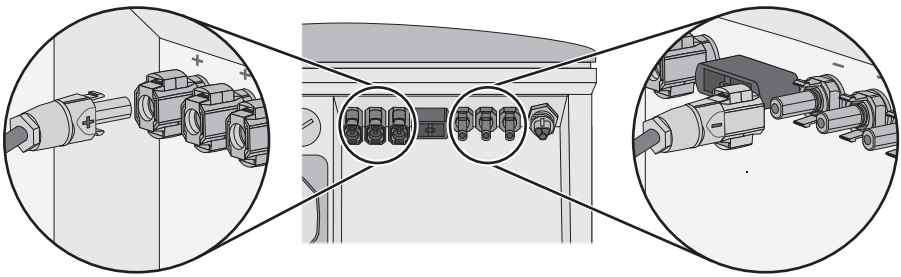


DANGER!
Danger to life due to live lid!

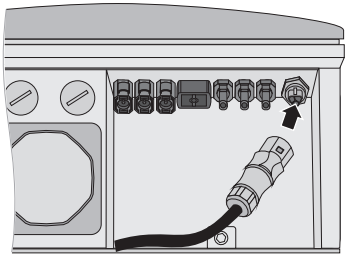
The grounding of the lid is ensured by the safety washers.

- Fasten the safety washers for all 6 screws with the toothing facing toward the lid.

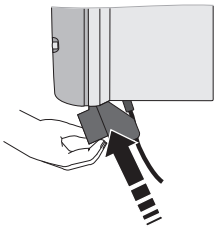
2. Check the DC plug connector for correct polarity and connect it.
   To release the plug connectors see section 7.2 "Opening the Inverter" (page 43).



3. Close all unnecessary DC inputs as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 33) to seal the inverter.
4. Connect the AC plug.



5. Check the Electronic Solar Switch for wear, as described in section 8.2 "Checking the Electronic Solar Switch for Wear" (page 51) and attach it firmly.

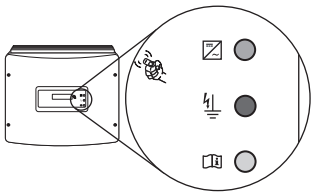


NOTICE!

The Electronic Solar Switch can be damaged if it is plugged on incorrectly!

- Do not tighten the screw inside the handle.
- Insert the handle of the Electronic Solar Switch securely in the socket on the bottom of the enclosure.
- Check whether the handle of the Electronic Solar Switch is securely connected.

6. Switch on the line circuit breaker.
7. Check whether the inverter's display and LED display indicate normal operating mode (see section 6 "Commissioning" (page 37)).



☑ The inverter is now closed and in operation.

8 Maintenance and Cleaning

Check the correct operation of the inverter at regular intervals. Impurities such as dust or airborne blossoms can cause heat concentration that can lead to yield losses. Also check the inverter and the cables for visible external damage. Undertake repairs if necessary.

8.1 Checking Heat Dissipation

You only need to check the heat dissipation of the inverter if, during a visual inspection, you notice a marked build-up in the fan screen or the inverter is increasingly observed to be in derating mode. Whether the inverter switches to derating mode depends on the ambient temperature and cooling efficiency.

8.1.1 Cleaning the Fan

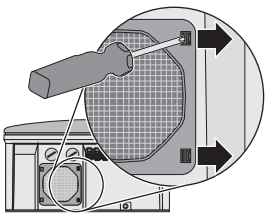
If the fan screen is only covered in loose dust it can be cleaned with a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

Proceed as follows:

1. Disconnect the inverter from both the DC and AC connections, as described in section 7.2 "Opening the Inverter" (page 43).
2. Wait for the fan to stop rotating.

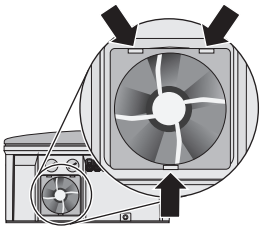
Cleaning the Fan Screen

3. Remove the fan screen:
   - Press both latches on the right of the fan screen to the right using a screwdriver and loosen from the bracket.
   - Carefully remove the fan screen.
4. Clean the fan screen with a soft brush, a paint brush, a cloth or pressurized air.



Cleaning the Fan

5. Push the two upper latches backward and the lower latch forward.
6. Remove the fan by pulling it slowly and carefully downward.



7. Unlock and unplug the fan plug inside the inverter.

   The fan cables are long enough that you can lift the fan far enough out to disconnect the internal plug connector in the inverter.
8. Remove the fan.
9. Clean the fan with a soft brush, a paint brush, or a damp cloth.

NOTICE!

Damage to the fan through the use of pressurized air.

- Do not use pressurized air to clean the fan. This can damage the fan.

10. After cleaning, assemble everything in reverse order.
11. Check the functioning of the fan as described in the following section.

8.1.2 Checking the Fan

You can check that the fan is working in 2 ways:

- Set the "Fan-Test" parameter to "1" in the installer mode (using Sunny Data Control, Sunny Explorer or Sunny WebBox).

  or
- Plug the provided jumper into the sequential control system board.

Setting Parameters

1. Request the installer password from the SMA Serviceline (contact: see page 73).
2. Set the "Fan-Test" parameter to "1" in the installer mode.
3. Check the air-flow of the fan.

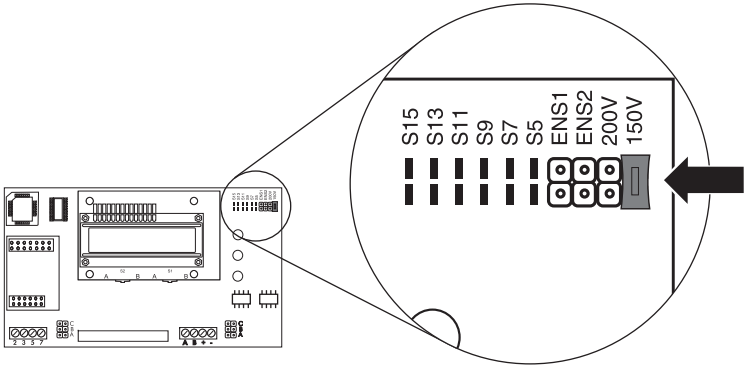
   The inverter sucks air in from underneath and then blows it back out on the upper left side. Listen for any unusual noise that could indicate incorrect installation or that the fan is faulty.
4. After checking the fan, set the "Fan-Test" parameter back to "0".

☑ You have finished checking the fan.

Plugging the Jumper

The inverter recognizes the jumper only after the system has been restarted (i.e. all LEDs must have gone out before a restart).

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 43).
2. Plug the provided jumper in the socket on the sequential control system board as shown below.



3. Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).
4. Restart the inverter.
5. Check the air-flow of the fan.

   The inverter sucks air in from underneath and then blows it back out on the upper left side. Listen for any unusual noise that could indicate incorrect installation or that the fan is faulty.
6. Remove the jumper. Open and close the inverter as described in section 7 "Opening and Closing" (page 43).

☑ You have finished checking the fan.

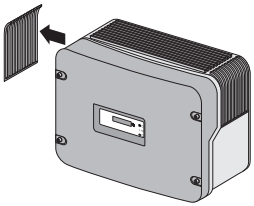
8.1.3 Cleaning the Ventilation Grids

There are ventilations grids on either side of the inverter. The inverter sucks air in from underneath through the fan and blows it out again on the upper left side via the ventilation grids. For optimal heat dissipation of the inverter, you only have to clean the left ventilation grid.

Procedure

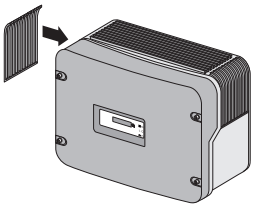
1. Remove the left ventilation grid.

   Insert your finger in the space between the ventilation grid and the upper part of the enclosure and remove the ventilation grid to the side.



2. Clean the ventilation grid with a soft brush, a paint brush, or pressurized air.
3. Re-attach the ventilation grid to the inverter.

   To help you identify the sides, the ventilation grids are marked with "links/left" or "rechts/right" on the inside.



☑ The ventilation grids are cleaned.

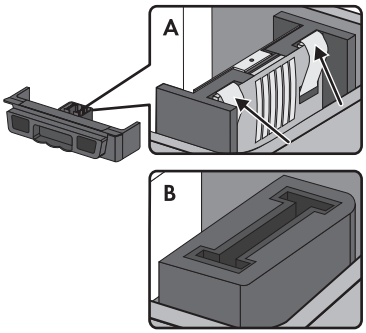
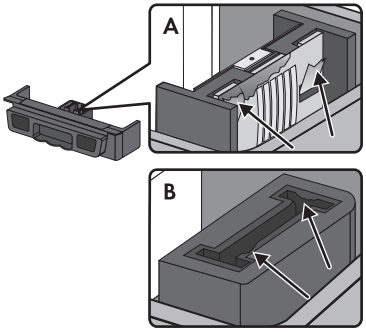
NOTICE!

Risk of damage to the inverter through intrusion of insects!

- The ventilation grids must not be removed permanently, because otherwise the device is not protected against the entrance of insects.

8.2 Checking the Electronic Solar Switch for Wear

Check the Electronic Solar Switch for wear before plugging it in. Depending on the shape of the Electronic Solar Switch, you can estimate the wear on either the metal tongues (shape A) or on the plastic (shape B).

Result	Measure
☑ The metal tongues in the Electronic Solar Switch are undamaged and not discolored (A). **or** ☑ The plastic in the Electronic Solar Switch is undamaged (B). 	1. Insert the handle of the Electronic Solar Switch securely in the socket on the bottom of the enclosure. 2. Commission the inverter as described in section 6 "Commissioning" (page 37).
☑ The metal tongues in the Electronic Solar Switch have a brown discoloration or are burned through (A). **or** ☑ The plastic in the Electronic Solar Switch shows thermal deformation (B). 	The Electronic Solar Switch can no longer safely disconnect the DC side. 1. Replace the Electronic Solar Switch handle before attaching it again (order number see section 12 "Accessories" (page 72). 2. Commission the inverter as described in section 6 "Commissioning" (page 37).

9 Troubleshooting

If the inverter displays blink codes or error messages other than those described in the following section, contact the SMA Serviceline.

You will also find a description of display messages during operation, status messages and measuring channels in the user manual provided.

Do not perform any repairs that are not described here and take advantage of the 24-hour replacement service (inverter ready for shipping and handed over to a haulage company within 24 hours) and the SMA Solar Technology AG repair service instead.

9.1 Blink Codes

Green	Red	Yellow	Status
is glowing continuously	is not glowing	is not glowing	OK (feeding-in operation)
	is glowing continuously	is not glowing	Ground fault or varistor defective
		is glowing continuously	OK (initialization)
is flashing quickly (3 x per second)	is not glowing	is not glowing	OK (stop)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is flashing slowly (1 x per second)	is not glowing	is not glowing	OK (waiting, grid monitoring)
goes out briefly (approx. 1 x per second)	is not glowing	is not glowing	OK (derating)
	is glowing continuously	is not glowing	Ground fault or varistor defective
is not glowing	is not glowing	is not glowing	OK (overnight shutdown)
		is not glowing	Error
	is glowing continuously	is not glowing	Ground fault or varistor defective
		glowing/flashing	Ground fault or varistor defective and disturbance

9.2 Error Messages

When a disturbance occurs, the inverter generates a message which depends on the operating mode and the type of the detected disturbance.

Message	Description and Corrective Measure
!PV-Overvoltage! !DISCONNECT DC!	Overvoltage at DC input. Overvoltage can destroy the inverter.
	Corrective measures Immediately disconnect the inverter from the grid. 1. Turn off the line circuit breaker. 2. Remove the Electronic Solar Switch. 3. Disconnect all the DC connectors. 4. Check DC voltage: – If the DC voltage exceeds the maximum input voltage, check the plant design or contact the person who installed the PV generator. – If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV generator as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 33). If the message appears again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 73)).
ACVtgRPro	The 10-minute-average grid voltage is no longer within the permissible range. This can be caused by either of the following: • The grid voltage at the connection point is too high. • The grid impedance at the connection point is too high. The inverter disconnects to assure compliance with the voltage quality of the grid.
	Corrective measures Check the grid voltage at the connection point of the inverter: • If, due to the local grid conditions, the grid voltage is 253 V or more, ask the electric power company whether the voltage at the feed-in point can be adjusted, or whether it would agree to an alteration of the limit value of the ACVtgRPro parameter for voltage quality monitoring. • If the grid voltage is continually within the acceptable range, and this error is still displayed, contact the SMA Serviceline.
Bfr-Srr	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.

Message	Description and Corrective Measure
Derating	The "Derating" operating mode is a normal operating mode which may occur occasionally and can have several causes. Once the inverter enters the "Derating" mode, it will display the "Derating" warning until the next total shutdown of the device (at the end of the day).
	Corrective measures • Check heat dissipation as described in section 8.1 "Checking Heat Dissipation" (page 47).
dZac-Bfr **dZac-Srr**	Sudden changes in grid impedance exceed the permissible range ("Bfr" or "Srr" are internal messages of no relevance for the user). For safety reasons, the inverter disconnects itself from the grid.
	Corrective measures Check the grid impedance and observe how often major deviations occur. • If repeated frequency variations occur and this is causing "dZac-Bfr" or "dZac-Srr" errors, ask the electric power company if it would agree to modify the operating parameters (dZac-Max). • Discuss changing the operating parameter with the SMA Serviceline.
EEPROM	Transition disturbance while data is being written or read from EEPROM. The data is not relevant for safe operation • The disturbance has no effect on the performance of the inverter.
EEPROM dBh	EEPROM data is defective, the device has switched off because the loss of data has disabled important functions of the inverter.
	Corrective measures • Contact the SMA Serviceline.
EeRestore	One of the duplicate data sets in the EEPROM is defective and has been reconstructed without loss of data. • The error message only serves to inform you and has no effect on the performance of the inverter.
Fac-Bfr **Fac-Srr** **FacFast**	The grid frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). For safety reasons, the inverter disconnects itself from the grid.
	Corrective measures • If the grid frequency is within the tolerance range, yet "Fac-Bfr", "Fac-Srr", or "FacFast" faults are being displayed often, contact the SMA Serviceline.

Message	Description and Corrective Measure
Imax / overcurrent	Overcurrent on the AC side. This message is displayed if the current on the AC grid is larger than specified.
	Corrective measures • Check the plant design and grid conditions.
K1-Close **K1-Open**	Error during relay test.
	Corrective measures • Contact the SMA Serviceline if this problem occurs often or several times in succession.
MSD-Fac	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
MSD-Vac	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
MSD-Timeout	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
MSD-Zac	Internal measurement comparison fault or hardware defect.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
Offset	The "Offset" operating condition is a normal operating condition that occurs prior to grid monitoring. If "O-ffset" is displayed as an error, then there is a disturbance in the data logging.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
Riso	The electrical insulation of the PV plant against ground is faulty. The resistance between the DC plus and/or DC minus connection and ground is outside the defined limit range.
	Corrective measures • Check the plant insulation. • Check the plant for ground faults as described in section 9.3.1 "Checking the PV Generator for a Ground Fault" (page 58).
ROM	The inverter firmware is faulty.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.

Message	Description and Corrective Measure
Shutdown	Temporary inverter disturbance.
	Corrective measures • Contact the SMA Serviceline.
Trafo-Temp-F	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature lies within the acceptable range.
	Corrective measures • If this problem recurs, check the heat dissipation of the inverter, as described in section 8.1 "Checking Heat Dissipation" (page 47).
Trafo-Temp-W	Temperatures in the transformer have exceeded the acceptable limit. The inverter stops feeding the grid until the temperature lies within the acceptable range. The Trafo-Temp-W warning is displayed until final shutdown (at the end of the day).
	Corrective measures • Check the heat dissipation of the inverter, as described in section 8.1 "Checking Heat Dissipation" (page 47).
Vac-Bfr **Vac-Srr**	The grid voltage on line 2 is no longer within the permissible range ("Bfr" or "Srr" is an internal message that has no meaning for the user). This code can be caused by any of the following conditions: • Grid disconnected (line circuit breaker, fuse), • AC cable is broken or • AC cable is highly resistive For safety reasons, the inverter disconnects itself from the grid.
	Corrective measures • Check the grid current and grid connection on the inverter. • If the grid voltage lies outside the acceptable range because of local grid conditions, ask the electric power company if the voltages can be adjusted at the feed-in point or if they agree to changes in the values of the monitored operational limits (operating parameters: Vac-Min and Vac-Max). • If the grid frequency is within the tolerable range, yet "Vac-Bfr", or "Vac-Srr" faults are still being displayed, please contact the SMA Serviceline.

Message	Description and Corrective Measure
Vpv-Max	Overvoltage at DC input. The inverter could be damaged.
	Corrective measures Immediately disconnect the inverter from the grid. 1. Turn off the line circuit breaker. 2. Remove the Electronic Solar Switch. 3. Disconnect all the DC connectors. 4. Check DC voltage: – If the DC voltage exceeds the maximum input voltage, check the plant design or contact the person who installed the PV generator. – If the DC voltage is below the maximum input voltage, reconnect the inverter to the PV generator as described in section 5.5.4 "Connecting the PV Generator (DC)" (page 33). If the message appears again, disconnect the inverter again and contact the SMA Serviceline (see section 13 "Contact" (page 73)).
Watchdog **Watchdog-Srr**	Internal program run fault.
	Corrective measures • If this fault continues to occur, contact the SMA Serviceline.
Zac-Bfr **Zac-Srr**	The grid impedance is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). For safety reasons, the inverter disconnects itself from the grid. The impedance is calculated from both the grid impedance and the impedance of the AC cable of the inverter.
	Corrective measures • Check the grid impedance and grid connection on the inverter. • Use an AC cable with an adequate cross-sectional area (= low impedance) as described in section 5.3 "Connection to the Power Distribution Grid (AC)" (page 22). If required, check and re-tighten the screws on the AC terminals. • If this fault recurs, contact the SMA Serviceline.

9.3 Red LED is Glowing Continuously

If the red status display LED lights up continuously during operation, there is a ground fault in the PV generator or at minimum one varistor for overvoltage protection is faulty.

Procedure

1. Check for ground faults in the PV generator as described in section 9.3.1 "Checking the PV Generator for a Ground Fault" (page 58).
2. If the red LED continues to glow, check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 60).

9.3.1 Checking the PV Generator for a Ground Fault

1. Disconnect the inverter from both the DC and AC connections as described in section 7.2 "Opening the Inverter" (page 43).

DANGER!

Risk of lethal electric shock!

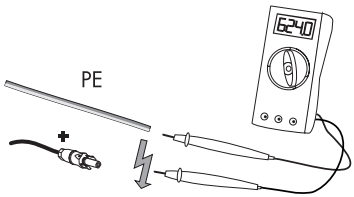
- Only touch the cables of the PV generator on their insulation.
- Do not connect strings with ground faults to the inverter.

NOTICE!

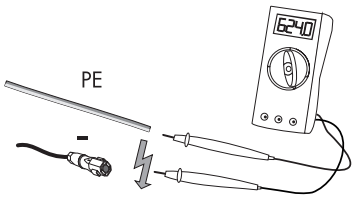
Excessive voltages can destroy the measuring device!

- Use only measuring devices with a DC input range of 1 000 V at minimum.

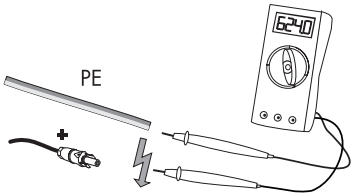
2. Measure the voltages between the plus pole of the strings and the ground potential (PE).



3. Measure the voltages between the minus pole of the strings and the ground potential (PE).



4. Measure the voltages between the plus pole and the minus pole of each string.



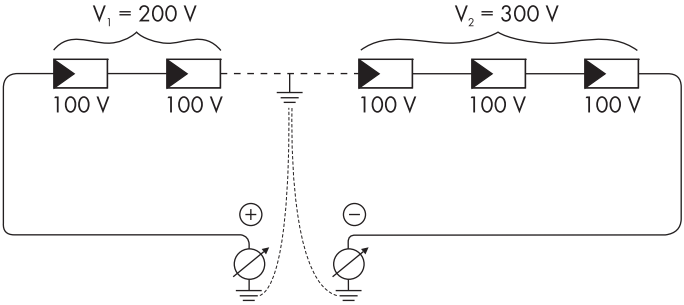
☑ If the voltages measured are stable and the total of the voltages from the plus pole against ground potential and the minus pole against ground potential of a string roughly corresponds to the voltage between the plus pole and minus pole, then there is a ground fault.

Result	Measure
☑ You have found **a ground fault**.	• The installer of the PV generator must remedy the ground fault in the affected string. You can determine the location of the ground fault as described below. • Do **not** reconnect the faulty string. • Commission the inverter as described in section 6.1 "Commissioning the Inverter" (page 37).
☑ You have found **no ground fault**.	It is likely that one of the thermally monitored varistors is defective. • Check the varistors as described in section 9.3.2 "Checking the Function of the Varistors" (page 60).

Location of the ground fault

The approximate position of the ground fault can be determined from the ratio of the measured voltages between the plus pole against ground potential (PE) and the minus pole against ground potential (PE).

Example:



In this case, the ground fault is between the second and third PV module.

☑ The ground fault check is finished.

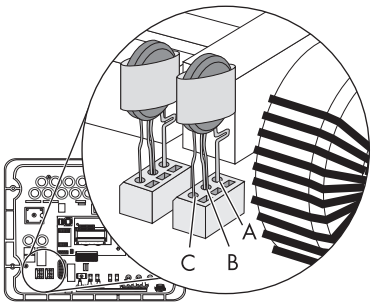
9.3.2 Checking the Function of the Varistors

Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltage. It is therefore possible that one of the thermally monitored varistors has lost its protective function.

Position of Varistors

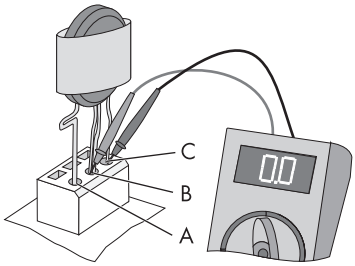
You can determine the position of the varistors using the illustration below. Observe the following allocation of the terminals:

- Terminal A: outer terminal (varistor connection **with crimp**)
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without crimp**)



You can check the functionality of the varistors in the following manner:

1. Open the inverter as described in section 7.2 "Opening the Inverter" (page 43).
2. Use a multimeter to ensure that all of the varistors in the installed state have a conducting connection between connectors B and C.



Result	Measure
☑ There is **a conducting** connection.	There is probably a different fault in the inverter. • Close the inverter as described in section 7.3 "Closing the Inverter" (page 45). • Contact the SMA Serviceline (see section 13 "Contact" (page 73)).
☑ There is **no conducting** connection.	The respective varistor is defective and must be replaced. Varistor is generally due to influences that affect all varistors similarly (temperature, age, induced overvoltage). SMA Solar Technology AG recommends replacing all varistors. The varistors are specially manufactured for use in inverters and are not commercially available. You must order replacement varistors directly from SMA Solar Technology AG (see section 12 "Accessories" (page 72)). • To replace the varistors, proceed to step 3.

NOTICE!

Destruction of the inverter due to overvoltage.

If varistors are missing, the inverter is no longer protected against overvoltages.

- Provide for replacement varistors immediately and replace the faulty varistors.
- For systems with a high risk of overvoltage, do **not** operate inverters with faulty varistors or no varistors at all.

3. Insert an insertion tool into the openings of the terminal contacts (1).

   ☑ The terminal clamps will loosen.

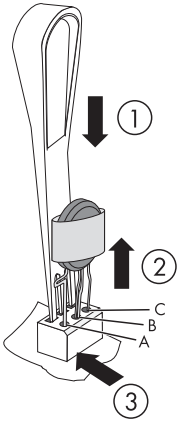
   If you do not receive an insertion tool for operating the terminal clamps with your replacement varistors, contact SMA Solar Technology AG. As an alternative, the individual terminal contacts can be operated using a 3.5 mm wide screwdriver.

4. Remove varistor (2).
5. Insert new varistor (3).

   The pole with the small loop (crimp) must be fitted to terminal 1 when replacing the varistor.

6. Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).

☑ The check and replacement of the varistors is completed.



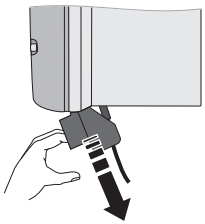
10 Decommissioning

10.1 Dismantling the Inverter

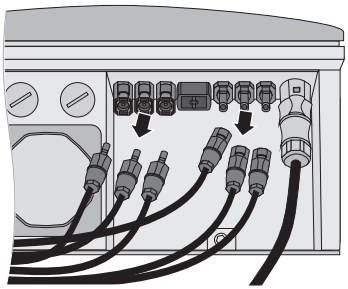
DANGER!
Danger to life due to high voltages in the inverter.

- Disconnect the line circuit breaker and prevent it from being reactivated.

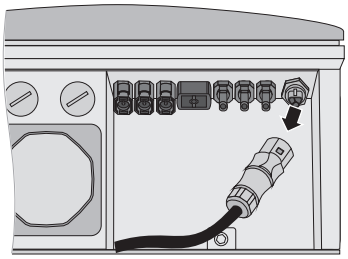
1. Remove the Electronic Solar Switch.



2. Release and remove all DC plug connectors (see section 7.2 "Opening the Inverter" (page 43)).



3. Remove the AC plug connector from the inverter.



4. Close the AC flange plug with the protecting cap.
5. Close all DC inputs with the corresponding DC plug connectors and sealing plugs.

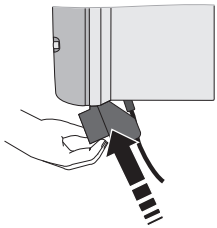
CAUTION!

Danger of burn injuries due to hot enclosure parts!

The inverter's enclosure can become hot during operation.

- Wait until the enclosure has cooled down.

6. If a communication cable is available:
   - Open the inverter as described in section 7.2 "Opening the Inverter" (page 43).
   - Remove the communication cable from the inverter.
   - Close the inverter as described in section 7.3 "Closing the Inverter" (page 45).
7. Connect the Electronic Solar Switch.

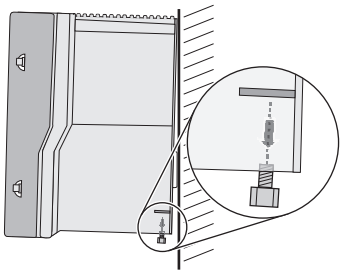


NOTICE!

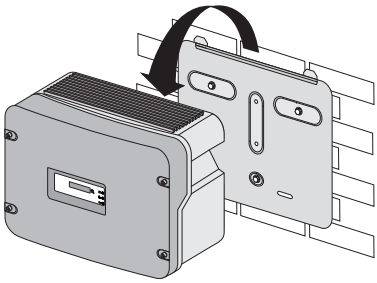
The Electronic Solar Switch can be damaged if it is plugged on incorrectly!

- Do not tighten the screw inside the handle.
- Insert the handle of the Electronic Solar Switch securely in the socket on the bottom of the enclosure.
- Check whether the handle of the Electronic Solar Switch is securely connected.

8. Remove the safety screw.



9. Lift the inverter off the wall mounting bracket.



☑ The inverter is dismantled.

10.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If it is no longer available, you can also use an equivalent carton. The box must be capable of being closed completely and made to support both the weight and the size of the inverter.

10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between − 25 °C and +60 °C.

10.4 Disposing of the Inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation location at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labeled "ZUR ENTSORGUNG" ("for disposal") (see section 13 "Contact" (page 73)).

11 Technical data

11.1 Sunny Boy 3300

DC Input

Maximum DC power	3 820 W
Maximum DC voltage*	500 V
MPP input voltage range	200 V ... 400 V
DC nominal voltage	200 V
PV start voltage, adjustable	250 V
Maximum input current	20 A
Maximum input current per string	16 A
Number of MPP trackers	1
Maximum number of parallel strings	3
Internal consumption during operation	< 7 W

* The maximum open circuit voltage, which can occur at a cell temperature of – 10 °C, may not exceed the maximum input voltage.

AC Output

Nominal AC power	3 300 W
Maximum AC power	3 600 W
Maximum output current	18 A
Maximum permissible fuse protection	25 A
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	< 3 %
Nominal AC voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
AC side	50 Hz / 60 Hz
Tolerance at AC grid frequency	± 4.5 Hz
Power factor at nominal AC power	1
Overvoltage category	III
Test voltage at 50 Hz	1.4 kV
Surge testing voltage	4 kV
Surge testing voltage with serial interface	6 kV
AC connection	Single-phase
Internal consumption in night mode	< 0.1 W

Mechanical Data

Width x height x depth	450 mm x 352 mm x 236 mm
Weight	38 kg

Climatic Conditions

Extended temperature range*	− 25 °C ... +60 °C
Extended air humidity range*	0 % ... 100 %
Extended air pressure range*	79.5 kPa ... 106 kPa
Temperature range**	− 25 °C ... +70 °C
Operating temperature range	− 25 °C ... +60 °C
Maximum operating altitude above mean sea level	2 000 m

* according to DIN EN 50178:1998-04, installation type C, class 4K4H

** according to DIN EN 50178:1998-04, transport type E, class 2K3

Features

Topology	LF transformer
Cooling concept	OptiCool
Fan connection	Designed for safe disconnection In accordance with DIN EN 60529

General Data

Protection rating*	IP65
Protection class	I
Noise emission (typical)	≤ 40 dB(A)

* according to DIN EN 60529

Protective Devices

All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (R_{iso} > 1 M Ω)	Insulation monitoring
Reverse polarity protection	Short circuit diode
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 2.1

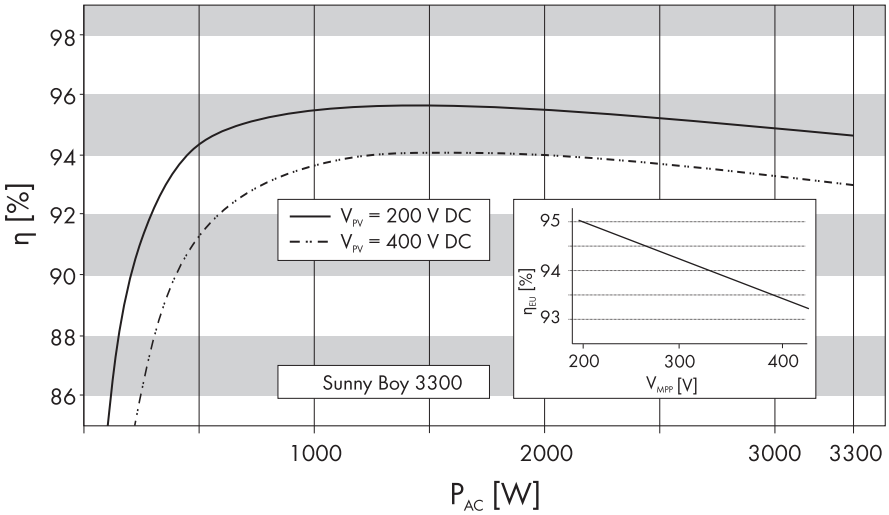
Communication Interfaces

RS485, galvanically isolated	optional
Radio	optional
Bluetooth® Wireless Technology	optional

Electronic Solar Switch

Electric service life in the event of a short-circuit, with a nominal current of 30 A	A minimum of 50 switching operations
Maximum switching current	30 A
Maximum switching voltage	800 V
Maximum PV power	10 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

Efficiency



Maximum efficiency	η_{max}	95.2 %
European efficiency	η_{EU}	94.4 %

11.2 Sunny Boy 3800

DC Input

Maximum DC power	4 040 W
Maximum DC voltage*	500 V
MPP input voltage range	200 V ... 400 V
DC nominal voltage	200 V
PV start voltage, adjustable	250 V
Maximum input current	20 A
Maximum input current per string	16 A
Number of MPP trackers	1
Maximum number of parallel strings	3
Internal consumption during operation	< 7 W

* The maximum open circuit voltage, which can occur at a cell temperature of – 10 °C, may not exceed the maximum input voltage.

AC Output

Nominal AC power	3 800 W
Maximum AC power	3 800 W
Maximum output current	18 A
Maximum permissible fuse protection	25 A
Harmonic distortion of output current at AC THD voltage < 2 %, AC power > 0.5 AC nominal power	< 3 %
Nominal AC voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
AC side	50 Hz / 60 Hz
Tolerance at AC grid frequency	± 4.5 Hz
Power factor at nominal AC power	1
Overvoltage category	III
Test voltage at 50 Hz	1.4 kV
Surge testing voltage	4 kV
Surge testing voltage with serial interface	6 kV
AC connection	Single-phase
Internal consumption in night mode	< 0.1 W

Mechanical Data

Width x height x depth	450 mm x 352 mm x 236 mm
Weight	38 kg

Climatic Conditions

Extended temperature range*	− 25 °C ... +60 °C
Extended air humidity range*	0 % ... 100 %
Extended air pressure range*	79.5 kPa ... 106 kPa
Temperature range**	− 25 °C ... +70 °C
Operating temperature range	− 25 °C ... +60 °C
Maximum operating altitude above mean sea level	2 000 m

* according to DIN EN 50178:1998-04, installation type C, class 4K4H

** according to DIN EN 50178:1998-04, transport type E, class 2K3

Features

Topology	LF transformer
Cooling concept	OptiCool
Fan connection	Designed for safe disconnection In accordance with DIN EN 60529

General Data

Protection rating*	IP65
Protection class	I
Noise emission (typical)	≤ 42 dB(A)

* according to DIN EN 60529

Protective Devices

All-pole DC disconnection unit	Electronic Solar Switch, DC plug system SUNCLIX
DC overvoltage protection	Thermally monitored varistors
Personal protection (R_{iso} > 1 M Ω)	Insulation monitoring
Reverse polarity protection	Short circuit diode
AC short circuit protection	Current control
All-pole AC disconnection unit	Automatic disconnection device SMA Grid Guard 2.1

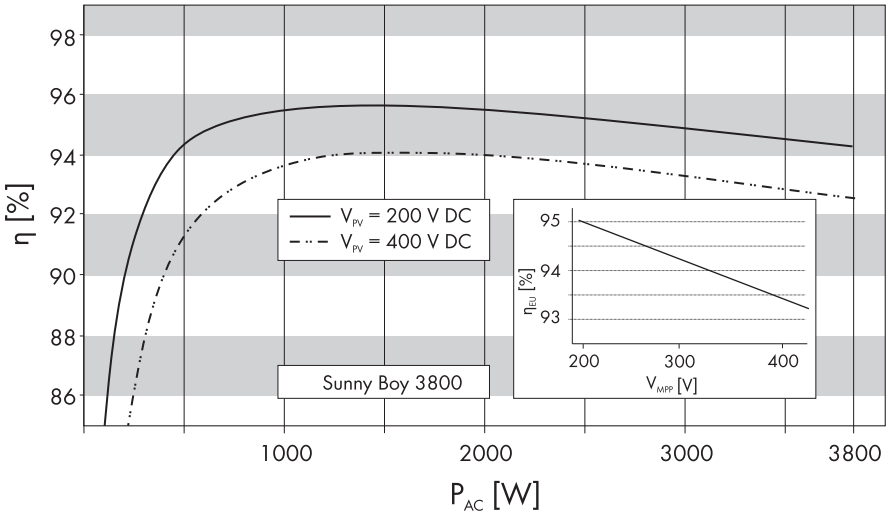
Communication Interfaces

RS485, galvanically isolated	optional
Radio	optional
Bluetooth	optional

Electronic Solar Switch

Electric service life in the event of a short-circuit, with a nominal current of 30 A	A minimum of 50 switching operations
Maximum switching current	30 A
Maximum switching voltage	800 V
Maximum PV power	10 kW
Protection rating when plugged	IP65
Protection rating when unplugged	IP21

Efficiency



Maximum efficiency	η_{max}	95.6 %
European efficiency	η_{EU}	94.7 %

12 Accessories

You will find the corresponding accessories and replacement parts for your product in the following overview. If required, you can order these from SMA Solar Technology AG or your dealer.

Description	Brief description	SMA order number
Ventilation grids	Ventilation grid set "right and left" as replacement part	45-7202
Electronic Solar Switch	ESS handle replacement part	ESS-HANDLE:02 Also enter the inverter's serial number.
Replacement varistors	Set of thermally monitored varistors (2) including insertion tool	SB-TV4
Insertion tool for replacing the varistors	Insertion tool for varistors	SB-TVWZ
Positive grounding set	Upgrade kit for the positive connection to ground of the DC input	ESHV-P-NR
Negative grounding set	Upgrade kit for the negative connection to ground of the DC input	ESHV-N-NR
RS485 upgrade kit	RS485 interface	485PB-NR
Bluetooth upgrade kit	*Bluetooth* interface	BTPBINV-NR
SUNCLIX DC plug connector	Field connector for conductor cross sections 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

13 Contact

If you have technical problems concerning our products, contact the SMA Serviceline. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type and number of connected PV modules
- Blink code or display message of the inverter
- Optional equipment, e.g. communication devices

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- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

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